



**U.S. Department of Energy**  
**Office of River Protection**

P.O. Box 450  
Richland, Washington 99352

03-OSR-0145

Mr. R. F. Naventi, Project Manager  
Bechtel National, Inc.  
2435 Stevens Center  
Richland, WA 99352

Dear Mr. Naventi:

CONTRACT NO. DE-AC27-01RV14136 - PARTIAL, CONDITIONAL APPROVAL OF  
AUTHORIZATION BASIS CHANGE NOTICE (ABCN) 24590-WTP-ABCN-ESH-02-033,  
REVISION 0, *APPLICATIONS OF IBC 2000 FOR DETERMINATION OF CLASSIFICATION  
OF CONSTRUCTION TYPE FOR THE RPP-WTP PROCESS FACILITIES*

- References:
1. BNI letter from R. F. Naventi to R. J. Schepens, ORP, "Transmittal for Approval: Authorization Basis Change Notice 24590-WTP-ABCN-ESH-02-033, Revision 0, *Applications of IBC 2000 for Determination of Classification of Construction Type for the RPP-WTP Process Facilities*," CCN: 035822, dated October 31, 2002.
  2. BNI letter from A. R. Veirup to M. K. Barrett, ORP, "Submittal for Concurrence – Revised Performance-Based Uniform Building Code Type II, Fire-Resistive Equivalency for the Low-Activity Waste, High-Level Waste, and Pretreatment Buildings," CCN: 041078, dated September 16, 2002.
  3. BNI letter from A. R. Veirup to M. K. Barrett, ORP, "Submittal for Concurrence – Performance-Based Uniform Building Code H-7 Occupancy Equivalency," CCN: 041079, dated September 17, 2002.
  4. BNI letter from R. F. Naventi to R. J. Schepens, ORP, "Request for Code Compliance Interpretation – Industrial Equipment Access Platforms – 1997 Uniform Building Code," CCN: 041208, dated October 7, 2002.

This letter provides partial, conditional approval of the subject ABCN. BNI provided the subject ABCN to the U.S. Department of Energy, Office of River Protection (ORP) on October 31, 2002 (Reference 1). Except for a proposed change to Section 2.7.2.2.1 of the General Information Volume of the Preliminary Safety Analysis Report (24590-WTP-PSAR-ESH-01-002-01), the ORP has found the ABCN conditionally acceptable.

The ABCN (24590-WTP-ABCN-ESH-02-033) proposed to adopt the non-structural portions (Chapters 1-15 and 24-35) of the 2000 edition of the International Building Code (IBC) in lieu of the similar portions of the 1997 edition of the Uniform Building Code (UBC). The UBC 1997 is currently identified as the building code applicable to the Waste Treatment and Immobilization Plant (WTP) in the Safety Requirements Document (SRD), Appendix C, Section 6.0.

Mr. R. F. Naventi

03-OSR-0145

Based on the information in Reference 1 and the enclosed SER, the proposed change to adopt the non-structural portions of IBC 2000 in lieu of the similar portions of the UBC 1997 is conditionally acceptable; there is reasonable assurance that the health and safety of the public, the workers, and the environment will not be adversely affected by this change, and that they comply with applicable laws, regulations, and WTP contractual requirements.

Based upon ORP approval of the 24590-WTP-ABCN-ESH-02-033, there is no need for DOE to take actions for the BNI requests provided in References 2, 3 and 4. As such, ORP is taking no action on these requests and they should be considered as withdrawn by BNI.

If you have any questions, please contact me, or your staff may call Lewis F. Miller, Jr., WTP Safety Regulatory Division, (509) 376-6817.

Sincerely,

Roy J. Schepens  
Manager

OSR:RWG

Enclosure

**Safety Evaluation Report (SER)  
of Proposed Authorization Basis Change Notice (ABCN)  
24590-WTP-ABCN-ESH-02-033, Rev. 0  
to the Safety Requirements Document (SRD)  
for the Waste Treatment and Immobilization Plant (WTP)**

## **1.0 INTRODUCTION**

The WTP authorization basis is the composite of information provided by a Contractor in response to radiological, nuclear, and process safety requirements that is the basis on which the U. S. Department of Energy (DOE), Office of River Protection (ORP) grants permission to perform regulated activities. The authorization basis includes that information requested by the Contractor for inclusion in the authorization basis and subsequently accepted by the ORP. The authorization basis for the WTP includes the SRD,<sup>1</sup> the General Information Volume<sup>2</sup> of the Preliminary Safety Analysis Reports (PSAR), and the PSARs for the Low Activity Waste<sup>3</sup> (LAW), High Level Waste<sup>4</sup> (HLW), and Pretreatment<sup>5</sup> buildings. The SRD contains the approved set of radiological, nuclear and process safety standards and requirements, which if implemented, provide adequate protection of workers, the public, and the environment against the hazards associated with the operation of the facility. The PSARs describe the analyzed safety basis for the facility (safety envelope), demonstrate that the facility will perform and be operated such that the radiological, nuclear, and process safety requirements are met, and demonstrate adequate protection of the public, workers, and the environment. The PSARs are based on the preliminary design of the WTP facilities and are part of the authorization basis for facility construction.

By letter dated October 31, 2002,<sup>6</sup> Bechtel National, Inc. (BNI, the Contractor) submitted proposed amendments to the SRD and PSARs (General, LAW, HLW, and Pretreatment). This SER documents the ORP evaluation of the information provided by the Contractor in support of the changes proposed in 24590-WTP-ABCN-ESH-02-033 for SRD, Volume II, Appendix C, Sections 6.0 and 10.0 and Chapters 2 of the PSAR General Information Volume and LAW, HLW and Pretreatment PSARs.

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<sup>1</sup> 24590-WTP-SRD-ESH-01-001-01, *Safety Requirements Document, Volume I* and 24590-WTP-SRD-ESH-01-001-02, *Safety Requirements Document, Volume II*

<sup>2</sup> 24590-WTP-PSAR-ESH-01-002-01, *Preliminary Safety Analysis Report to Support Construction Authorization: General Information*, Revision 0

<sup>3</sup> 24590-WTP-PSAR-ESH-01-002-03, *Preliminary Safety Analysis Report to Support Construction Authorization: LAW Facility Specific Information*, Revision 0

<sup>4</sup> 24590-WTP-PSAR-ESH-01-002-04, *Preliminary Safety Analysis Report to Support Construction Authorization: HLW Facility Specific Information*, Revision 0

<sup>5</sup> 24590-WTP-PSAR-ESH-01-002-02, *Preliminary Safety Analysis Report to Support Construction Authorization: PT Facility Specific Information*, Revision E

<sup>6</sup> BNI letter, R. F. Naventi to R. J. Schepens, DOE, *Transmittal for Approval: Authorization Basis Change Notice 24590-WTP-ABCN-ESH-02-033, Revision 0, "Applications of IBC 2000 for Determination of Classification of Construction Type for the RPP-WTP Process Facilities and Analytical Laboratory,"* CCN: 035822, dated October 31, 2002.

## 2.0 BACKGROUND

The SRD contains the set of radiological, nuclear, and process safety standards necessary to ensure adequate protection of the health and safety of workers, co-located workers, the public, and the environment from radiological, nuclear, and process hazards. The SRD standards are developed by an iterative process. Included in the development process is a continuing review of industry practices, particularly those referenced in the SRD, and review of the results of the process hazards and accident analyses as they evolve with the design of the facility for potential impact on the SRD standards used to ensure protection of the public and workers.

In ABCN 24590-WTP-ABCN-ESH-02-033, the Contractor proposed to change SRD Appendix C, Sections 6.0 and 10.0 to retain the UBC 1997 as the applicable building code for the WTP project, but with tailoring of the UBC by replacing the non-structural portions of UBC 1997 (Chapters 1 through 15 and Chapters 24 through 35) with the similar portions of IBC 2000 (Chapters 1 through 15 and Chapters 24 through 35) for the main process buildings (LAW, HLW, and Pretreatment) and the Analytical Laboratory Facility. The Balance of Facilities structures will continue to follow the structural and non-structural provisions of the 1997 UBC. Appropriate sections of the PSARs (General Information, Pretreatment, LAW, and HLW volumes) were revised to change the building construction reference for Fire Protection Features from UBC 1997 to IBC 2000, including building construction types based on IBC 2000 non-structural provisions.

DOE O 420.1A has a provision that all new construction must conform to the Model Building Code applicable for the state or region. The Washington Administrative Code (WAC), Section 51-40-003 states that the 1997 edition of the UBC as published by the International Council of Building Officials (ICBO) is adopted by reference as the applicable Model Building Code for Washington State. The Contractor determined through application of their ISM standard-setting process, consistent with DOE/RL-96-0004, *Process for Establishing a Set of Radiological, Nuclear, and Process Safety Standards and Requirements for the RPP Waste Treatment Plant Contractor*, that safety and technical bases existed for the WTP process buildings and the Analytical Laboratory to not conform to the Washington Model Building Code by substituting compliance with IBC 2000 (Chapters 1-15 and 24-35). As such, the Contractor submitted 24590-WTP-ABCN-ESH-02-033 proposing to modify SRD Appendix C and Chapter 2 of the PSARs to adopt the non-structural requirements of the IBC 2000 (Chapters 1-15 and 24-35) in lieu of the similar chapters from UBC 1997.

Because the IBC 2000 specifies construction types with fire ratings meeting acceptable fire safety resistance requirements and the proposed changes do not affect the level of fire safety provided by SRD Section 4.5 Safety Criteria or the associated implementing codes and standards, the Contractor requested approval to revise the project authorization basis to incorporate the changes proposed by 24590-WTP-ABCN-ESH-02-033.

### 3.0 EVALUATION

#### 3.1 Proposed change to SRD, Volume II, Appendix C, Section 6.0, NFPA 801, Standard for Facilities Handling Radioactive Materials

SRD Section 4.5, Fire Protection, contains the 25 Safety Criteria applicable to the WTP Fire Protection Program and the design and construction of facility fire protection features [structures, systems, and components (SSCs)]. For all but two of the Safety Criteria, National Fire Protection Association (NFPA) Standard 801-95, *Standard for Facilities Handling Radioactive Materials*, is identified as an implementing code and standard. SRD Appendix C, Section 6.0 identifies tailoring of NFPA 801-95. ABCN 24590-WTP-ABCN-ESH-02-033 proposed additional tailoring to SRD Appendix C, Section 6.0 to identify that, for the WTP process buildings (LAW, HLW, and Pretreatment) and the Analytical Laboratory, the non-structural portions of the 1997 UBC (Chapters 1-15 and 24-35) are changed to the IBC 2000.

SRD, Volume II, Appendix C, Section 6.0, Building Construction, currently states:

‘Replace “(Type I or Type II in accordance with NFPA 220, Standard on Types of Building Construction)” with “(Fire resistance in accordance with the 1997 edition of the Uniform Building Code [UBC]).”

**Justification:** The applicable building code for WTP Project is the 1997 Uniform Building Code (UBC). UBC specifies building requirements for fire resistance, allowable floor area, building height limitations, and building separation.’

ABCN 24590-WTP-ABCN-ESH-02-033 proposed to change SRD, Volume II, Appendix C, Section 6.0 to read as follows:

‘Replace “(Type I or Type II in accordance with NFPA 220, Standard on Types of Building Construction)” with “(Fire resistance in accordance with the 1997 edition of the Uniform Building Code [UBC] and for the process buildings (LAW, HLW, and PT) and the Analytical Laboratory, the 2000 edition of the International Building Code [IBC]).”

**Justification:** The applicable building code for WTP Project is the 1997 Uniform Building Code (UBC). UBC specifies building requirements for fire resistance, allowable floor area, building height limitations, and building separation.

For the process buildings (LAW, HLW, and PT) and the Analytical Laboratory Facility, the non-structural portions of the 1997 UBC (Chapters 1-15 and 24-35) are updated to the IBC 2000. The IBC 2000 is the follow on model building code to 1997 UBC and replaces the UBC.’

Evaluation (Conditionally Acceptable):

ABCN 24590-WTP-ABCN-ESH-02-033 proposed replacing the non-structural portions of UBC 1997 with corresponding chapters of IBC 2000. IBC 2000, the follow on model building code to UBC 1997, better addressed special purpose industrial facilities such as the WTP process buildings.

The UBC was formatted into chapters grouped into volumes that separate nonstructural requirements from structural requirements. The IBC followed a similar chapter format that correlates directly with the chapters in the UBC. There was very little cross-reference or dependencies between the nonstructural and structural sections of either code. As stated in the ABCN (24590-WTP-ABCN-ESH-02-033), BNI evaluated replacing the nonstructural section of the UBC (Chapters 1-15 and 24-35) with the corresponding chapters of the IBC and determined it to have no affect on the remaining structural sections of the UBC. BNI communicated with the International Conference of Building Officials (ICBO), whose members were involved in the development of both the UBC and IBC, to determine if this code separation was acceptable. ICBO responded<sup>7</sup> that they were “99% certain” that the non-structural chapters of the codes do not rely on the structural portions for their development and no items would be affected by separation of the nonstructural chapters of the code from the structural chapters. ICBO further noted that they would be against mixing non-structural portions of the UBC and IBC, but making a break between the non-structural and structural components “would not be the same concern.” To evaluate this separation issue further, BNI contracted with a building code expert (W. E. Koffel, Koffel Assoc., Inc.). The code expert provided a report<sup>1</sup> to the project that likewise concluded that separation of the building codes in this manner could be implemented “without any adverse affect on fire protection or life safety from fire.” Further, the Koffel report stated that the structural provisions of the IBC were essentially independent of the remainder of the Code. The IBC structural provisions were determined by a completely separate Code Development Committee from the committee responsible for the non-structural provisions. Although there were a few references between the structural provisions and the remainder of the IBC, the Koffel report stated “we did not find any cross-references between the structural chapters of the IBC and other portions of the Code that are not adequately addressed by the structural provisions of the UBC. As such, the concept of using the structural provisions from the UBC and the remaining provisions from the IBC should not result in features that are not adequately addressed.” Finally, the Koffel report noted that, while mixing two code documents raised the potential for conflicts to occur between the provisions, in this instance “we did not identify any conflicts that might arise if the structural provisions of the UBC are used” (along with the nonstructural provisions of the IBC).

The structural/seismic design and analysis of the WTP LAW building has been completed on the basis of compliance with the requirements of the UBC 1997. As stated in the ABCN (24590-WTP-ABCN-ESH-02-033), BNI evaluated the IBC 2000 structural requirements and determined the seismic loads used in the UBC analysis for the LAW building bound the required seismic loads from the IBC 2000. BNI further concluded the

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<sup>7</sup> BNI telephone conversation record, M. S. Rees, BNI to Dennis McCreary, ICBO, *IBC 2000 Non-Structural/Structural Interface*, CCN: 042364, dated September 19, 2002.

design criteria for the structural elements of the LAW building are enveloped by the UBC. As such, re-analysis of the LAW building for compliance with the structural requirements of IBC 2000, which would involve significant cost, is not necessary. For both the Seismic Category (SC) I HLW and PT buildings, the applied structural requirements were American Concrete Institute (ACI) 349<sup>8</sup> and American National Standards Institute/American Institute for Steel Construction (ANSI/AISC) N690.<sup>9</sup> As such, the seismic/structural designs and analyses for the HLW and Pretreatment buildings were not impacted by the changes proposed by 24590-WTP-ABCN-ESH-02-033 and were not dependent on the seismic/structural requirements from either the UBC or IBC.

Both the UBC and IBC provide standards to safeguard life or limb, health, property and public welfare by regulating and controlling the design, construction, quality of materials, use and occupancy, location and maintenance of all buildings and structures within its jurisdiction. Because of this essentially universal applicability (i.e., from residential dwellings, kennels, and car washes to high-rise buildings, malls, schools, hospitals, and factories), compliance to the building code requirements could result in required levels of structural fire resistance that exceed the fire hazards posed by special purpose industrial facilities, such as the WTP. However, this concern is lessened by the higher limits on building areas and heights for a given construction type and lower fire-resistance ratings for building structural elements allowed by IBC 2000.

The following sections discuss significant differences between the UBC 1997 and IBC 2000.

#### Building Code Construction Type and Structural Steel Fireproofing

Since BNI has not completed the building code evaluations for the WTP processing buildings and the Analytical Laboratory for compliance with the IBC 2000, the specific areas/structural features that will be fire-proofed and the degree of fire-resistivity to be provided have not yet been determined. As such, it was not possible to evaluate the ABCN in terms of the specifics of the fireproofing of structural features. Instead, the ABCN was evaluated on the basis of general requirements and approaches.

The UBC, Table 6-A, *Types of Construction – Fire-Resistive Requirements*, would require that some of the larger WTP process buildings (e.g., the Pretreatment building) be classified and designed as Type I, F.R. construction. Type I, F.R. construction requires interior bearing walls and the building structural frame to be of noncombustible construction with a fire resistive rating of at least 3 hours. The Preliminary Fire Hazards Analyses (PFHAs) for the WTP process buildings have not identified any potential fires with durations equal to or greater than two hours. As such, prescriptive UBC compliance would result in structural fire resistance that exceeds the fire hazards posed by the facility design, process, and operations, as analyzed and documented in the PFHAs.

Based on discussions with BNI architectural personnel, the reviewers identified that

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<sup>8</sup> ACI 349-01, *Code Requirements for Nuclear Safety-Related Concrete Structures*.

<sup>9</sup> ANSI/AISC N690-94, *Specification for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities*.

preliminary results from IBC building code evaluations of the three WTP process buildings per IBC 2000 indicate that the Pretreatment building will be Type I-B construction, HLW (except for the annex) will be Type II-A construction, HLW annex (separated from the HLW building by a 2-hour fire wall) will be Type II-B construction, LAW will be Type II-B construction (based on the deletion of the LAW canister storage area from the Project scope), and the Analytical Laboratory will by Type II-B construction. IBC Table 601, *Fire-Resistance Rating Requirements for Building Elements (hours)*, required the following:

Building Element	Type I		Type II	
	A	B	A	B
Structural frame Including columns, girders, trusses	3	2	1	0
Bearing walls				
Exterior	3	2	1	0
Interior	3	2	1	0
Nonbearing walls and partitions	See Table 602 See Section 602			
Exterior				
Interior				
Floor construction Including supporting beams and joists	2	2	1	0
Roof construction Including supporting beams and joists	1½	1	1	0

Based solely on the table above, structural elements meeting IBC Type II-A construction (e.g., HLW) would not be protected for fires greater than one hour in duration and structural elements in Type II-B construction (e.g., LAW and Analytical Laboratory) would not be protected at all. However other IBC, National Fire Protection Association (NFPA), and DOE requirements applicable to WTP must be considered in determining the extent of fire-resistance to be provided to building structural elements, as follows:

- a. DOE-STD-1066-97, Fire Protection Design Criteria, applied to all of the WTP process buildings and the Analytical Lab. Section 9.2 of the Standard, Fire Barriers, subsection 9.2.2, Fire Resistance, required that, where required by the FHA or SAR, the structural shell surrounding critical areas and their supporting members should remain standing and continue to act as a confinement structure during anticipated fire conditions including failure of any fire suppression system not designed as a safety class item. Fire resistance of this shell should be attained by an integral part of the structure (concrete slabs, walls, beams, and columns) and not by composite assembly (membrane fireproofing). In no event should the fire resistance rating be less than 2 hours under conditions of failure of any fire suppression system not designed as a safety class item. DOE-STD-1066-97 is an implementing standard for the applicable Fire Protection Safety Criteria in Section 4.5 of the Safety Requirements Document (SRD). As such, all fire area boundaries (concrete slabs, walls, beams, and columns) and all penetrations



through those boundaries within the WTP process buildings and the Analytical Lab must designed and constructed with a minimum fire-rating of 2 hours. In addition, the minimum fire resistance rating applicable to a fire area boundary applied also to any building construction supporting the fire area.

In addition to the fire area boundary requirements from DOE-STD-1066, DOE O 420.1A, Section 4.2.2.4 requires that, for new facilities, redundant safety class systems [Safety Design Class (SDC) systems for the protection of the public per the WTP classification scheme] shall be in separate fire areas. SRD Safety Criterion 4.5-5 further stated that redundant Safety Design Significant (SDS) systems should be in separate fire areas. Thus, the fire-proofing/fire resistance requirements identified for fire area boundaries above, would have to be extended to any other areas or structural features required to protect WTP SDC and SDS systems in accordance with the Order and SRD.

- b. IBC Table 302.3.3, Required Separation of Occupancies (Hours) required fire-rated separations between different occupancies. Examples likely applicable to WTP process buildings include the following:
- B – F-2 occupancy separation required a two-hour rated wall with two-hour rated penetrations through the wall.
  - B – H-4 occupancy separation required a one-hour rated wall with one-hour rated penetrations through the wall.
  - B – S-1 occupancy separation required a three-hour rated wall with three-hour rated penetrations through the wall.
  - B – S-2 occupancy separation required a two-hour rated wall with two-hour rated penetrations through the wall.
  - F-2 – H-4 occupancy separation required a two-hour rated wall with two-hour rated penetrations through the wall.
  - F-2 – S-1 occupancy separation required a three-hour rated wall with three-hour rated penetrations through the wall.
  - F-2 – S-2 occupancy separation required a two-hour rated wall with two-hour rated penetrations through the wall.
  - H-4 – S-1 occupancy separation required a one-hour rated wall with one-hour rated penetrations through the wall.
  - H-4 – S-2 occupancy separation required a one-hour rated wall with one-hour rated penetrations through the wall.
  - S-1 – S-2 occupancy separation required a three-hour rated wall with three-hour rated penetrations through the wall.

- c. IBC Section 414.2.3, Separation, required the fire-resistance rating for fire barrier assemblies in Group H occupancies to be in accordance with Table 414.2.2. Table 414.2.2 required either one-hour rated fire barriers (third floor of the building and below) or two-hour rated fire barriers (above the third floor of the building). IBC Section 414.2 also stated that the floor construction of the control area (title of IBC Section 414.2) and construction supporting the floor of the control area shall have a minimum 2-hour fire-resistance rating. Thus, as indicated by the IBC expert consultant (Mr. Koffel) during his meeting with BNI and DOE personnel and as documented in his report<sup>10</sup> to BNI, the minimum fire resistance rating applicable to the floor of an elevated fire area also applied to any building construction supporting the floor.

IBC Section 302.3.3 did allow some exceptions for these occupancy separation requirements, except for Group H occupancies. Specifically, where the building was equipped throughout with an automatic sprinkler system, the fire-resistance ratings in Table 302.3.3 could be reduced by one hour but not to less than one hour and not to less than that required for floor construction according to the type of construction.

- d. Vertical exit enclosures (IBC Section 706), exit passageways (IBC Section 706), horizontal exits (IBC Section 706), incidental use areas (IBC Section 706), and shaft enclosures (IBC Section 707) must be fire-rated (i.e., meet the fire-resistance requirements) in accordance with the requirements of IBC Sections 302.3.3 and 1005.3 and Table 302.1.1, as applicable, and NFPA 101 Sections 5-1.3 (Separation of Means of Egress), 5-2.2.6 (Enclosure and Protection of Stairs), 5-2.4 (Horizontal Exits), 6-2.3 (Fire Barriers), 6-2.4 (Vertical Openings), 6-4 (Special Hazard Protection), and NFPA 101 Chapters 28 (Industrial Occupancies) and 29 (Storage Occupancies).
- e. NFPA 75, Standard for the Protection of Electronic Computer/Data Processing Equipment, required that computer areas within buildings be separated from other occupancies within the building, including atria or other open-space construction, by fire-resistant-rated construction. The computer room shall be separated from other occupancies in the computer area by fire-resistant-rated construction. The fire resistance rating shall be commensurate with the exposure but not less than 1 hour. The fire-resistant-rated enclosures shall extend from the structural floor to the structural floor above or to the roof. This requirement would impact the use of fire-proofing in the WTP process building annexes.

#### Fire-Rated Penetrations in Interior Bearing Walls and Permanent Partitions

The WTP process buildings designs includes many interior bearing walls and permanent partitions (i.e., nonbearing walls) that were internal to, but not part of, a fire area boundary. The UBC was vague on the requirements for penetrations through these walls

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<sup>10</sup> Letter from W. E. Koffel to L. D. Kessie, BNI, *Impact of Using the International Building Code, 2000 Edition*, dated March 24, 2003.

and partitions. The Koffel Report<sup>11</sup> stated that “while many will say that the penetrations of bearing and nonbearing walls need not be protected, there is no specific section of the Code that can be identified as offering that guidance. In fact, the UBC could be interpreted to require that penetrations of bearing and nonbearing walls be protected regardless of their function.” BNI obtained a formal International Council of Building Officials (ICBO) interpretation on this issue<sup>12</sup> that stated “all walls delineated in Table 6-A and any other wall which is required to be of fire-resistive construction by provisions of the code are required to comply with Section 709.6.1 for through penetrations.” Compliance with the UBC would result in the installation of fire-rated penetrations in applications not required for fire area separation, occupancy separation, life safety, etc.

The IBC offered more clarity regarding the protection of openings and penetrations in bearing and nonbearing walls that have a fire-resistance rating. IBC Section 711.3 stated that penetrations of fire walls, fire barriers, smoke barrier walls, and fire partitions must be protected as required by IBC Section 711. If a fire-resistance rated bearing or nonbearing wall was not also serving one of the identified purposes, the penetrations were not required to be protected.

IBC 2000, Section 503, *General Height and Area Limitations*, contained requirements for buildings considered to be special industrial occupancies (Section 503.1.2), as follows:

*“Buildings and structures designed to house low-hazard industrial processes that require large areas and unusual heights to accommodate cranes or special machinery and equipment, including among other, rolling mills; structural metal fabrication shops and foundries; or the production and distribution of electric, gas or steam power, shall be exempt from the height and area limitations of Table 503.”*

Use of this section for buildings of noncombustible construction allows an IBC construction classification of Type II-B. IBC Type II-B construction requires a fire-resistance rating of zero (i.e., no fire-resistance rating) for all building structural elements, including the structural frame (columns, girders, trusses), bearing walls (exterior and interior), and floors and roofs (including supporting beams and joists). Use of this IBC provision could conflict with SRD Safety Criterion 4.5-13, that requires the fire protection program and features to be characterized by a level of fire protection that is sufficient to fulfill the requirements of the best protected class of industrial risks (“Highly Protected Risk” or “Improved Risk”) and provided protection to achieve “defense-in-depth.” For this reason, the reviewers determined that, as a condition of approval for 24590-WTP-ABCN-ESH-02-033, notification of ORP was required, including documented justification for the applicability of Section 503.1.2, in each instance where the Contractor decided to apply these requirements to a WTP process building or the Analytical Laboratory. In addition, the Preliminary Fire Hazards Analysis (PFHA) must provide the analysis and conclusions that support the Contractor’s determination that the

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<sup>11</sup> Letter from W. E. Koffel to L. D. Kessie, BNI, *Impact of Using the International Building Code, 2000 Edition*, dated March 24, 2003.

<sup>12</sup> ICBO letter, C. L. Pruitt to K. R. Hampton, BNI, *Fire Resistive Rating of Exterior Nonbearing Walls, Table 5-A; Floor Area, Section 207-F; Roof Framing, Section 306.2.2; Through Penetrations, Section 709.6.1; Uniform Building Code, 1997 Edition*, dated July 9, 2002.

building is of a low-hazard use.

Thus, in conclusion, while the details of fire-resistance provided for structural elements in the WTP process buildings and Analytical Laboratory won't be known until BNI completes the building code evaluations and implements the IBC requirements into the building designs, the reviewers concluded that compliance with the non-structural requirements of the IBC 2000 and the requirements of other codes and standards, as discussed above, would result in the design and construction of the WTP process buildings and Analytical Laboratory to:

- a. Maintain continued compliance with applicable laws and regulations and conformance to top-level standards (e.g., DOE/RL-96-0006, *Top-Level Radiological, Nuclear, and Process Safety Standards and Principles for the RPP Waste Treatment Plant Contractor*).
- b. Achieve adequate safety by:
  - Protecting SDC and SDS SSCs from the hazards associated with postulated fires in the WTP process buildings, Analytical Laboratory, and in adjacent structures (per item f under Building Code Construction Type and Structural Steel Fireproofing above).
  - Protecting adjoining occupancies from postulated fires in the WTP process building and Analytical Laboratory spaces (per item a under Building Code Construction Type and Structural Steel Fireproofing above).
  - Ensuring that fire area boundaries (walls, ceilings, and floors) are, at a minimum, two-hour, fire-rated barriers, including similarly rated penetrations through the barriers (per items b and c under Building Code Construction Type and Structural Steel Fireproofing above).
  - Protecting control rooms/computer rooms in the WTP process building annexes through fireproofing/structural fire resistance in accordance with NFPA 75 requirements (per item e under Building Code Construction Type and Structural Steel Fireproofing above).
  - Designing and constructing the building structural elements supporting the floors of elevated fire areas to withstand the effects of a two-hour fire without structural failure (per items b and c under Building Code Construction Type and Structural Steel Fireproofing above).
  - Designing and constructing vertical exit enclosures, exit passageways, horizontal exits, incidental usage areas, and shaft enclosures with fire-resistance ratings in accordance with the requirements of the IBC and Life Safety Code (NFPA 101) (per item d under Building Code Construction Type and Structural Steel Fireproofing above).

- Compliance with the IBC 2000 requirements for interior bearing walls and permanent partitions.

In addition, the reviewers determined that, with one exception, the changes proposed by 24590-WTP-ABCN-ESH-02-033 are not in conflict the requirements in the SRD. A slightly modified version of DOE O 420.1A is currently used as an implementing code and standard for all of the fire protection-related Safety Criteria in SRD Section 4.5. DOE O 420.1A has a provision that all new construction to conform to the Model Building Code applicable for the state or region. The WAC, Section 51-40-003, adopted the 1997 edition of the UBC by reference as the applicable Model Building Code for Washington State. The Contractor determined through application of their ISM process, consistent with DOE/RL-96-0004 and the proposed changes to the SRD, the General Information Volume of the PSAR, and the LAW), HLW, and PSARs as documented in 24590-WTP-ABCN-ESH-02-033, that safety and technical bases exist for the WTP process buildings and the Analytical Laboratory to substitute the provisions of IBC 2000 for UBC 1997 (the Washington Model Building Code). As discussed above, adequate safety is achieved and conformance with applicable laws and regulations and top-level standards and principles (i.e., RL/REG-96-0006) is maintained with adoption of the non-structural portions of the IBC 2000 (Chapters 1-15 and 24-35) in lieu of the similar portions from UBC 1997. On this basis, the reviewers concluded that for the WTP process buildings and Analytical Laboratory, the use of the IBC 2000 in lieu of the Washington Model Building Code, was acceptable.

As a Condition of Acceptance, BNI must reflect this tailoring of the implementing code and standard DOE O 420.1A to substitute compliance with the UBC 2000 in lieu of the Washington Model Building Code in the revised pages of the SRD.

As a Condition of Acceptance for approval of 24590-WTP-ABCN-ESH-02-033, the reviewers determined that the WTP PFHAs must be revised, as necessary, in the next scheduled update following issuance of this SER to reflect the adoption of the non-structural portions of the IBC 2000 (Chapters 1-15 and 24-35) in lieu of the similar portions from UBC 1997.

### 3.2 Proposed change to SRD, Volume II, Appendix C, Section 10.0, UBC 97, Uniform Building Code

As noted above, SRD Section 4.5, Fire Protection, contained the 25 Safety Criteria applicable to the WTP Fire Protection Program and the design and construction of facility fire protection features (SSCs). SRD Safety Criterion 4.5-2 required buildings containing a significant quantity of radioactive and/or hazardous material to be constructed (walls, floors, and ceilings) of noncombustible or fire-resistive material. DOE O 420.1A, *Facility Safety*, was listed as an implementing code and standard for this Safety Criterion. SRD Appendix C, Section 4.0 contained tailoring for the Implementation Guide, DOE G-420.1/G-440.1, for the Fire Safety Program part of DOE O 420.1. Tailoring of Section III.5.0 of the Implementation Guide identified that the applicable building code for the WTP Project was the 1997 Uniform Building Code (UBC). SRD Appendix C, Section 10.0 included tailoring of requirements from the UBC. ABCN 24590-WTP-ABCN-ESH-02-033 proposed additional tailoring to SRD Appendix C, Section 10.0 to identify that,

for the process buildings (LAW, HLW, and Pretreatment) and the Analytical Laboratory, Chapters 1 through 15 and 24 through 35 of the 1997 UBC were replaced with corresponding Chapters of the 2000 International Building Code (IBC). The proposed SRD revision identified this tailoring as required for use by the WTP contractor as a daughter standard referenced by the implementing standard for fire protection.

ABCN 24590-WTP-ABCN-ESH-02-033 proposed to change SRD, Volume II, Appendix C, Section 10 to add the following:

“The following tailoring of UBC 97 is required for use by the WTP contractor as a daughter standard referenced by the implementing standard for fire protection, as noted.

**Chapters 1 through 15 and 24 through 35**

Applicable to the process buildings (LAW, HLW, and PT) and the Analytical Laboratory Facility, replace Chapters 1 through 15 and 24 through 35 of the 1997 UBC with corresponding Chapters of the International Building Code (IBC).

**Justification:** For the process buildings (LAW, HLW, and PT) and the Analytical Laboratory Facility, the non-structural portions of the 1997 UBC are updated to the IBC 2000. The IBC 2000 is the follow on model building code to 1997 UBC and replaces the UBC.”

Evaluation (Acceptable): The proposed changes to SRD, Volume II, Appendix C, Section 10.0 acceptable because they reflect the change from the non-structural portions of the UBC 1997 to the non-structural portions of the IBC 2000, as discussed and conditionally accepted in Section 3.1 above. The changes properly reflect that, while the UBC 1997 is retained as the applicable building code for the WTP project, the non-structural portion of the UBC 1997 (Chapters 1-15 and 24-35) are replaced and updated by the non-structural portion (Chapters 1-15 and 24-35) of the IBC 2000 for the WTP process buildings (LAW, HLW, and Pretreatment) and the Analytical Laboratory.

3.3 Proposed change to 24590-WTP-PSAR-ESH-01-002-01, Preliminary Safety Analysis Report to Support Construction Authorization; General Information, Rev. 0

The General Information Volume of the PSAR, Section 2.7.2.2.1, *Building Construction*, stated: “Fireproofing of structural steel in ITS buildings will be provided in accordance with NFPA 220. At locations where an analysis of fire time-temperature effects on the structural steel members demonstrate no need for fire proofing, appropriate equivalency will be established.”

ABCN 24590-WTP-ABCN-ESH-02-033 proposed to change Section 2.7.2.2.1 to read: “Fireproofing of structural steel in the process buildings and the Analytical Laboratory will be provided in accordance with the 2000 International Building Code (IBC).”

Evaluation (Partially Acceptable): With one exception, the reviewers found the proposed changes to Section 2.7.2.2.1 of 24590-WTP-PSAR-ESH-01-002-01 acceptable because they:

- Reflected the change from the non-structural portions of the UBC 1997 to the non-structural portions of the IBC 2000, as discussed and conditionally accepted in Section 3.1 above; and,
- Corrected the PSAR to limit the scope for the fireproofing of structural steel in accordance with the requirements of IBC 2000 to the WTP process buildings and the Analytical Laboratory, again consistent with the change from the UBC to IBC discussed and conditionally accepted in Section 3.1 above.

The exception was the proposed deletion of the sentence committing to using time-temperature analysis to show the acceptability of structural steel subjected to fire-related conditions instead of providing fireproofing of structural steel in accordance with building code requirements. From discussions with BNI safety and architectural personnel, the reviewers were informed that this change was not made because of the proposal to adopt the non-structural requirements of IBC 2000, but rather reflected BNI's desire to streamline the content of the PSAR. As such, the reviewers concluded that approval of this change was not appropriate as part of the scope of 24590-WTP-ABCN-ESH-02-033, and it was not evaluated. This change is not approved by this SER and should be included, as appropriate, with the authorization basis amendment request submitted for PSAR streamlining.

3.4 Proposed change to 24590-WTP-PSAR-ESH-01-002-02, Preliminary Safety Analysis Report to Support Construction Authorization; PT Facility Specific Information, Rev. E

The Pretreatment PSAR, Section 2.7.6.2, *Fire Protection Features*, stated: "Consistent with applicable building separation criteria (Uniform Building Code [UBC] 1997, Table 5A), the exterior walls of the building will be non-combustible and non-rated insulated metal panels. The building is classified as a Type II FR structure in accordance with the UBC."

ABCN 24590-WTP-ABCN-ESH-02-033 proposed to change Section 2.7.6.2 to read: "Consistent with applicable building separation criteria (International Building Code [IBC] 2000), the exterior walls of the building will be non-combustible and non-rated insulated metal panels. The building is classified as a Type II B structure in accordance with the IBC."

Evaluation (Conditionally Acceptable): With one exception, the reviewers found the proposed changes to Section 2.7.6.2 of 24590-WTP-PSAR-ESH-01-002-03 acceptable because they reflect the change from the non-structural portions of the UBC 1997 to the non-structural portions of the IBC 2000, as discussed and conditionally accepted in Section 3.1 above. The exception was the proposed change from a Type II FR structure (per UBC 1997) to a Type II B structure (per IBC 2000). This change was not acceptable because the building code evaluation for the Pretreatment building has not been completed. As a condition of approval of the ABCN, the Pretreatment structural fire rating (per IBC) shall be shown as undetermined until the building code evaluation is completed. The Pretreatment PSAR shall be updated to reflect the final structural fire rating in the first update following completion of the building code evaluation.

3.5 Proposed change to 24590-WTP-PSAR-ESH-01-002-03, Preliminary Safety Analysis Report to Support Construction Authorization; LAW Facility Specific Information, Rev. 0

The LAW PSAR, Section 2.7.4.2, Fire Protection Features stated: “Consistent with applicable building separation criteria (UBC 1997, Table 5A), the exterior walls of the building will be noncombustible and nonrated. Exterior walls will be insulated metal panels. The building is classified as a Type II FR structure in conformance with the UBC.”

ABCN 24590-WTP-ABCN-ESH-02-033 proposed to change Section 2.7.4.2 to read: “Consistent with applicable building separation criteria (IBC 2000), the exterior walls of the building will be noncombustible and nonrated. Exterior walls will be insulated metal panels. The building is classified as a Type II B structure in conformance with the IBC.”

Evaluation (Conditionally Acceptable): With one exception, the reviewers found the proposed changes to Section 2.7.4.2 of 24590-WTP-PSAR-ESH-01-002-03 acceptable because they reflect the change from the non-structural portions of the UBC 1997 to the non-structural portions of the IBC 2000, as discussed and conditionally accepted in Section 3.1 above. The exception was the proposed change for LAW from a Type II FR structure (per UBC 1997) to a Type II B structure (per IBC 2000). This change was not acceptable because the building code evaluation for the LAW building has not been completed. As a condition of approval of the ABCN, the LAW structural fire rating (per IBC) shall be shown as undetermined until the building code evaluation is completed. The LAW PSAR shall be updated to reflect the final structural fire rating in the first update following completion of the building code evaluation.

3.6 Proposed change to 24590-WTP-PSAR-ESH-01-002-04, Preliminary Safety Analysis Report to Support Construction Authorization; HLW Facility Specific Information, Rev. 0

The HLW PSAR, Section 2.7.1.2, Fire Protection Features stated: “Consistent with applicable building separation criteria (UBC 1997, Table 5A), the exterior walls of the building will be noncombustible and nonrated. Exterior walls will be insulated metal panels. The building is classified as a Type II FR structure in accordance with the UBC.”

ABCN 24590-WTP-ABCN-ESH-02-033 proposed to change Section 2.7.1.2 to read: “Consistent with applicable building separation criteria (IBC 2000), the exterior walls of the building will be noncombustible and nonrated. Exterior walls will be insulated metal panels. The building is classified as a Type II B structure in conformance with the IBC.”

Evaluation (Conditionally Acceptable): With one exception, the reviewers found the proposed changes to Section 2.7.1.2 of 24590-WTP-PSAR-ESH-01-002-04 acceptable because they reflect the change from the non-structural portions of the UBC 1997 to the non-structural portions of the IBC 2000, as discussed and conditionally accepted in Section 3.1 above. The exception was the proposed change for HLW from a Type II FR structure (per UBC 1997) to a Type II B structure (per IBC 2000). This change was not



acceptable because the building code evaluation for the HLW building has not been completed. As a condition of approval of the ABCN, the HLW structural fire rating (per IBC) shall be shown as undetermined until the building code evaluation is completed. The HLW PSAR shall be updated to reflect the final structural fire rating in the first update following completion of the building code evaluation.

#### **4.0 CONCLUSION**

On the basis of the considerations described above, ORP has concluded there is reasonable assurance that the health and safety of the public, the workers and the environment will not be adversely affected by the proposed adoption of the non-structural requirements of the IBC in lieu of the similar requirements of the UBC 1997. The changes proposed by 24590-WTP-ABCN-ESH-02-033 do not alter compliance with applicable laws and regulations, maintain conformance with top-level standards (i.e., DOE/RL-96-0006), and do not constitute a significant reduction in commitment or effectiveness.

Accordingly, the proposed changes to adoption of the non-structural requirements of the IBC 2000 in lieu of the similar requirements of the UBC 1997 are approved with the following conditions:

1. BNI shall inform ORP of its intention to design any of the WTP process buildings or the Analytical Laboratory per Section 503.1.2 of the IBC and provide documented justification for the applicability of the low hazard industrial occupancy to the specific WTP building(s) involved. In addition, the Preliminary Fire Hazards Analysis (PFHA) must provide the analysis and conclusions that support the Contractor's determination that the building is of a low-hazard use. (See Section 3.1)
2. BNI must reflect tailoring of the implementing code and standard DOE O 420.1A to substitute compliance with the UBC 2000 in lieu of the Washington Model Building Code in the revised pages of the SRD. (See Section 3.1)
3. The WTP PFHAs must be revised, as necessary, in the next scheduled update following issuance of this SER to reflect the adoption of the non-structural portions of the IBC 2000 (Chapters 1-15 and 24-35) in lieu of the similar portions from UBC 1997. (See Section 3.1)
4. The proposed changes to the Pretreatment (Section 2.7.6.2, Fire Protection Features), HLW (Section 2.7.1.2, Fire Protection Features), and LAW (Section 2.7.4.2, Fire Protection Features) PSARs by 24590-WTP-ABCN-ESH-02-033 are conditionally approved. The proposed changes to classify each of the buildings as IBC 2000 Type II-B before the associated building code evaluations are completed are not approved. The structural fire rating of these buildings shall be underdetermined until the building code reevaluations to the IBC 2000 are completed. Once the building code reevaluations to the IBC 2000 are completed, the PSARs must be revised to reflect the structural classifications supported by the analyses. (See Sections 3.4, 3.5, and 3.6)